Regional Operational Plan SF.3X.2014.09

Spawning Abundance of Kobuk River Sheefish, 2014–2015

by

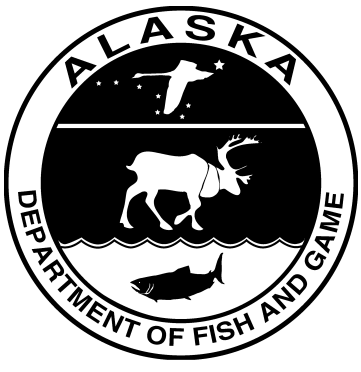
James W.

Savereide and

Jiaqi Huang

March 2015

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**



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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

REGIONAL OPERATIONAL PLAN SF.3X.2014.09

SPAWNING ABUNDANCE OF KOBUK RIVER SHEEFISH, 2014–2015

by

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March 2015

The Regional Operational Plan Series was established in 2012 to archive and provide public access to operational plans for fisheries projects of the Divisions of Commercial Fisheries and Sport Fish, as per joint-divisional Operational Planning Policy. Documents in this series are planning documents that may contain raw data, preliminary data analyses and results, and describe operational aspects of fisheries projects that may not actually be implemented. All documents in this series are subject to a technical review process and receive varying degrees of regional, divisional, and biometric approval, but do not generally receive editorial review. Results from the implementation of the operational plan described in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author if you have any questions regarding the information provided in this plan. Regional Operational Plans are available on the Internet at: http://www.adfg.gov/sf/publications/

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SIGNATURE/TITLE PAGE

Project Title:	Spawning Abundance of Kobuk River Sheefish, 2014-2015
Project leader(s):	James W. Savereide Fishery Biologist III
Division, Region and Area	Sport Fish, Region III, Fairbanks
Project Nomenclature:	Project F-10-25 and F-10-26; Study S
Period Covered	15 September 2014–15 October 2015
Plan Type:	Category II

Approval

Title	Name	Signature	Date
Project leader	James Savereide		
Biometrician	Jiaqi Huang		
Research Coordinator	Matt Evenson		
Regional Supervisor	Don Roach		3/5/15

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ABSTRACT

The primary goal of this project is to enumerate the outmigration of post-spawning sheefish *Stenodus leucichthys* to obtain an estimate of the spawning abundance. Estimates of spawning frequency are needed to determine the total spawning stock because sheefish are known to skip years between spawning events. If deriving estimates of spawning frequency is not possible then a reliable index of the stock would be needed to manage the resource. This project will provide an annual estimate of the spawning abundance, which will provide mangers with a reliable index of the total sheefish stock. Sonar techniques will be used to record images of sheefish during their outmigration to overwintering areas in Hotham Inlet and Selawik Lake. The estimate will be a census of the spawning stock because images will be recorded 24 hours a day, 7 days a week throughout the run.

Key words: Sheefish, *Stenodus leucichthys*, sonar, Kobuk River, spawning abundance, subsistence, spawning frequency.

PURPOSE

The Kobuk River sheefish population supports inriver subsistence and sport fisheries along with winter subsistence and commercial fisheries that occur in Hotham Inlet and Selawik *Lake*. Because sheefish are known to skip a year or more after spawning, estimates of spawning frequency are critical in determining whole population sizes based on spawning population estimates. Recent studies have led to a better understanding of spawning frequency and timing, which can be coupled with a sonar assessment of spawning abundance to derive an estimate of total stock abundance. However, if spawning frequency estimates are too erratic to expand spawning abundance estimates, then a reliable index of the whole population would be required to effectively manage this resource. Total annual estimates of the spawning abundance would provide this index.

The primary purpose of this project is to estimate the abundance of mature sheefish outmigrating from the Kobuk River in 2014 and 2015.

BACKGROUND

Sheefish or inconnu *Stenodus leucichthys* are an extremely important resource in northwest Alaska; their importance stems from their extensive use as a subsistence food, their value as a commercial resource, and their reputation as a trophy sport fish (Georgette and Loon 1990). The Kobuk River sheefish population supports inriver subsistence and sport fisheries along with winter subsistence and commercial fisheries that occur in Hotham Inlet and Selawik Lake (Figure 1). Sheefish harvested in Hotham Inlet and Selawik Lake are a mixed-stock comprised of the only 2 known spawning populations in the region, the Selawik and Kobuk River populations (Alt 1987). The exploitation of these stocks is poorly understood due to incomplete estimates of total annual harvest, unknown stock composition in the mixed-stock winter fisheries, and unknown total exploitable stock abundance. An understanding of these basic elements is necessary to describe the population dynamics of each stock and identify sustainable harvest levels. However, before conducting additional spawning population assessments, a better understanding of spawning locations, run timing, and spawning frequency is required. Because sheefish are iteroparous and known to skip a year after spawning, estimates of spawning frequency are critical in determining whole population sizes based on spawning population estimates. Recent studies have led to a better understanding of spawning frequency and timing, which can be coupled with a sonar assessment of spawning abundance to derive an estimate of total stock abundance, or in the very least provide a reliable index of the population as a whole.

OBJECTIVES

The objective for 2014–2015 is to:

1. enumerate the total number of mature outmigrating sheefish from the Kobuk River.

METHODS

A Dual-frequency Identification Sonar (DIDSON; Model 300 Sound Metrics Corp., Lake Forest Park, WA) will be placed on the north side of the Kobuk River on an inclined gravel bar that stretches across the river to the south side cut-bank. This type of river profile is preferred to ensure ensonification of the entire area where fish are migrating. The objective is to position the sonar so it can record images from the entire river, 24 hours a day, 7 days a week. The Kobuk River is approximately 30 m wide where we would like to set-up the sonar station. On low frequency the sonar can ensonify up to 40 m. If whitefish are present in significant proportions then 2 sonars will be used to ensonify the river on high frequency, which allows for more precise length measurements from the fish images. The DIDSON will be mounted to a portable aluminum stand that is moved manually to adjust for water depth. A small generator will provide the required power to run the sonar equipment. Small weir structures will be deployed at each site to ensure migrating sheefish pass through the sonar beam. The DIDSON will be deployed over the course of the outmigration from 15 September to 15 October (Savereide 2014).

It is possible that we may encounter a number of whitefish during the sampling period. To ensure all fish recorded are actually sheefish, a number of beach seine hauls throughout the outmigration will be conducted near the study area. A count and length of all species will be recorded. If a large proportion of fish in the beach seine are whitefish, which are smaller in size, then length compositions will be used to cull out images of fish smaller than 700 mm in total length because previous studies have shown nearly all spawning sheefish are greater than this size (Savereide 2014).

Two technicians will be assigned to enumerate the sheefish outmigration in the Kobuk River. One or two additional biologists/technicians will assist with the beach seine hauls and initial DIDSON deployment and training.

Data Collection

All recorded data from the sonar will be stored as 20 minute long files on an external hard drive capable of holding a large number of data files. Two technicians will ensure the sonar is running 24 hours a day by monitoring the equipment throughout the day (0800 to 2200) and multiple 2 hour checks throughout the evening (2200 to 0800). They will be responsible for any adjustments necessary due to water level and/or debris.

Data Reduction

Recorded data from the sonar will be stored and processed using DIDSON Control and Display software Version 5.25.48. The sonar data will be transformed to video-like images and the sheefish migrating downstream the sonar site will be identified and tallied. Tallied data from the sonar files will be entered into a Microsoft Excel® spreadsheet.

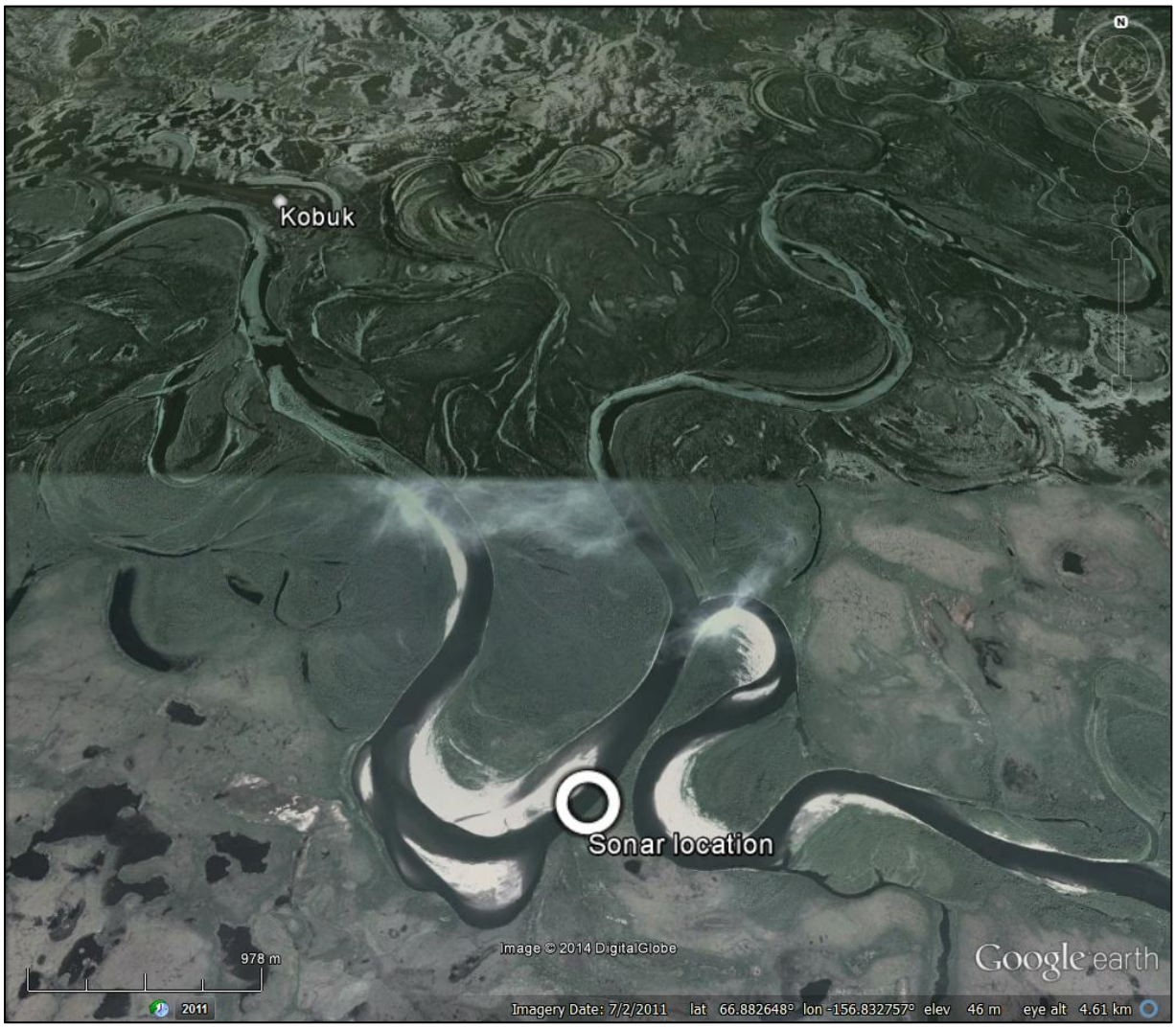

Figure 1–Map of the Upper Kobuk River demarcating the sonar location.

Final copies of the spreadsheet file will be provided with the completed report when it is submitted for review to be archived in the Sport Fish Division Docushare repository.

Data Analysis

Daily estimates of abundance will be determined inseason by expanding the number of targets counted for 20 minutes of every hour in a day. Two technicians will tally the number of sheefish migrating downstream from the top of every hour to 20 minutes past. This count will be multiplied by three to estimate the number of sheefish by hour. The total count for the day will be the sum of the hourly estimates. The variance will not be calculated inseason because a census of spawning abundance will be completed postseason by counting the total number of targets over the entire outmigration.

SCHEDULE AND DELIVERABLES

Results from this project will be summarized annually in a Fishery Data Series Report for which a draft will be submitted to the Research Supervisor by 1 March each year. Dates for sampling activities are summarized below.

Sampling = (S), Mobilization = (M), Demobilization = (D), Analysis = (A), FDS Report = (R)

Date	Kobuk Sonar
September 12–September 14	M
September 15–October 15	S/D
October	A
March	R

RESPONSIBILITIES

Project Staff and Primary Assignments

James Savereide, *Fisheries Biologist III*. Project Leader. Responsible for supervision of all aspects of the Kobuk River sonar project, managing the project budget, and writing the final report.

Loren St. Amand, *Fish & Wildlife Technician III*. Crew leader. Mobilization, day-to-day project tasks, all aspects of field work, demobilization.

Carmen Daggett, *Fish & Wildlife Technician II* – Mobilization, day-to-day project tasks, all aspects of field work, demobilization.

Jiaqi Huang, *Biometrician III*. Assist with project design and data analysis.

Matt Evenson, *Fishery Biologist IV*. Final report editing and project support.

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